

What is claimed is:

- Sub 1. A data collection system comprising:
- a) a plurality of telemetry devices, each telemetry device including:
    - i) a sensor configured to generate a series of successive measurements by measuring a parameter at a series of measurement times,
    - ii) a memory configured to store a plurality of measurements from said series of successive measurements, and
    - iii) a transmitter configured to transmit measurements stored in memory to a collection device at a series of transmission times; and
  - b) a plurality of collection devices, there being fewer collection devices than telemetry devices, each collection device including:
    - i) a hub to receive transmissions from the sensor, and
    - ii) a network device to forward at least a subset of a series of said transmissions over a network connection to a data processing center to generate an output function.

2. The data collection system of claim 1, wherein the network connection comprises an internet connection.

3. The data collection system of claim 1, wherein said network device further comprises an internet interface.

4. The data collection system of claim 3, wherein said Internet interface further comprises an e-mail client, a Hypertext Transmission Protocol (HTTP) server, and a telnet daemon.

5. The data collection system of claim 1, further comprising an e-mail server.

6. The data collection system of claim 1, wherein said sensor comprises:

a counter to store a value;

means for incrementing said counter upon receipt of a trigger signal; and

means for storing said value from said counter in said memory and resetting said counter at said measurement times.

7. The data collection system of claim 1, wherein said telemetry devices further comprise a first timer having a predetermined time interval, wherein the expiration of said predetermined time interval causes said sensor to generate a measurement.

8. The data collection system of claim 1, wherein said hub comprises a radio-frequency local area network (LAN) transceiver.

9. The data collection system of claim 1, wherein said hub comprises a radio-frequency local area network (LAN) receiver.

10. The data collection system of claim 1, wherein said hub comprises a power line carrier LAN transceiver.

11. The data collection system of claim 1, wherein said network device is electronically connected to the hub.

12. The data collection system of claim 11, wherein the network device is serially connected to the hub using Recommended Standard-232 (RS232).

13. The data collection system of claim 1, wherein said parameter is selected from the group consisting of electrical power, fluid flow, voltage, current, temperature, pressure, and humidity.

14. The data collection system of claim 1, wherein the series of measurements are selected from the group consisting of a pulse count, an analog voltage, a current level, and a multi-byte digital value.

15. The data collection system of claim 1, wherein the data processing center forwards one or more commands through the network connection to the hub.

16. The data collection system of claim 15, wherein the one or more commands contain configuration information.

17. The data collection system of claim 15, wherein the hub passes the one or more commands to a subset of the plurality of telemetry devices.

Sub 17  
17. A method of collecting data comprising the steps of:

receiving a series of successive measurements from a series of transmissions from a telemetry device;

storing and filtering the series of successive measurements; and

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transmitting the filtered data through an internet connection to a processing center.

19. The method of claim 18, further comprising the steps of:

time stamping the filtered data;  
storing the filtered data; and  
forwarding the filtered data to an internet interface.

20. The method of claim 19, wherein transmitting the filtered data through the internet connection further comprises triggering an e-mail to forward at least a subset of the stored filtered data.

21. The method of claim 20, wherein triggering the e-mail comprises sending data after a predetermined period of time.

22. The method of claim 20, wherein triggering the e-mail comprises sending data after receiving a predetermined number of packets.

23. The method of claim 18, wherein transmitting the filtered data through the internet connection further comprises:

dialing an internet service provider (ISP) to  
establish a point-to-point protocol (PPP) connection;  
sending the filtered data via an internet e-mail  
message;  
retrieving incoming command messages from the data  
processing center;  
acting upon the incoming command messages;  
sending responses to the incoming command messages;  
and  
disconnecting the PPP connection.

24. The method of claim 18 wherein transmitting the  
filtered data through the internet connection further  
comprises:

using a continuously connected modem to establish  
the internet connection;  
sending the filtered data via an internet e-mail  
message;  
retrieving incoming command messages from the data  
processing center;  
acting upon the incoming command messages; and  
sending responses to the incoming command messages.

25. The method of claim 24, wherein the modem  
comprises a cable modem.

26. The method of claim 24, wherein the internet connection is a Dynamic Host Configuration Protocol (DHCP) connection.

27. The method of claim 18, wherein analyzing said series of successive measurements to generate the filtered data further comprises validating data according to at least one preset criterion.

Sub 28. A network device connected to a receiving device configured to collect data generated by a plurality of sensors, comprising:

a micro-processor to process data generated by the plurality of sensors and collected by the receiving device, including time-stamping and filtering;

at least one storage device to store at least a subset of processed data; and

a transmitter to transmit data through an internet connection to a data processing center.

29. The network device of claim 28, wherein the receiving device comprises a transceiver.

30. The network device of claim 28, wherein the receiving device comprises a receiver.

31. The network device of claim 28, wherein the network device is connected to the receiving device using a serial port.

32. The network device of claim 28, wherein the transmitter transmits data to the internet via an ethernet connection.

33. The network device of claim 28, wherein the transmitter transmits data to the internet via a wireless Internet Protocol (IP).

34. The network device of claim 28, wherein the transmitter transmits data to the internet via a dial-up PPP connection.

35. The network device of claim 28, further comprising a multiplexer to route data between the micro-processor and the transmitter.

36. The network device of claim 28, wherein the network device is permanently connected to the internet.

37. The network device of claim 28, wherein the network device is connected to the internet by a dial-up PPP connection through an ISP.



38. The network device of claim 28, wherein the network device hosts at least one web page to display configuration information.

39. The network device of claim 28, wherein the device hosts at least one web page to display data generated by the plurality of sensors.

40. The network device of claim 28, wherein the device is installed in a location behind a corporate firewall.

41. A network device configured to collect data generated by a plurality of sensors, comprising a computer program, residing on the device, the computer program comprising instructions for causing the device to:

interface with a LAN device, the LAN device receiving data from the plurality of sensors;  
store and forward data; and  
interface a network connection to transmit data to a remote center.

42. The network device of 41, wherein the instruction to interface with the LAN device further comprises instructions to:

detect arrival of data from the plurality of sensors;

process the data; and  
send commands from the remote center to the LAN  
device.

43. The network device of 41, wherein the  
instructions to process the data further comprise  
instructions to trigger an e-mail containing the processed  
data.

44. The network device of 41, wherein the  
instructions to interface the network connection comprise  
instructions to send data through an e-mail client.

45. The network device of 41, wherein the  
instructions to interface the network connection comprise  
instructions to send data through a HTTP server in response  
to a request.

46. The network device of claim 41, wherein the  
instructions to interface the network connection comprise  
instructions to send data through a telnet daemon in  
response to a request.

Sub 17  
EP 17  
A data collection system, comprising:  
a plurality of sensors residing in a meter, each of  
the plurality of sensors being configured to sample a

parameter value at discrete measurement times and including a transmitter configured to transmit measured data; and

a collector having a receiver configured to receive data transmitted by the plurality of sensors, a processor configured to filter and store data received by the receiver from the plurality of sensors, and a transmitter configured to transmit the filtered data to a monitoring station for processing by an internet connection.

48. The data collection system of claim 47, wherein the monitoring station processes the filtered data to compute electricity usage information.

49. A data collection system, comprising:

a plurality of measurement sensor means each located near a consumer of electricity for measuring data relating to consumer usage of electricity and for transmitting the measured electricity usage data; and

a collector means having a receiver for receiving electricity usage data transmitted by the plurality of sensor means, a processor for computing electricity usage information from electricity usage data received by the receiver, and a transmitter for transmitting the electricity usage information to a remote center through an internet connection.

50. The data collection system of claim 49, wherein the plurality of measurement sensor means measures data relating to consumer usage of gas and for transmitting the measured gas usage data.

*Sub 10*  
51. A network for collecting data generated by a plurality of sensors, comprising:

a) a plurality of data generating devices including:

i) a sensor to measure a parameter to generate measurements,

ii) a memory configured to store said measurements, and

iii) a transmitter to transmit said stored measurements to an intermediate device at a plurality of transmission times; and

b) a plurality of intermediate devices, there being fewer intermediate devices than data generating devices, said intermediate devices including:

i) a receiver to receive transmissions from a subset of said plurality of data generating devices,

ii) a processor to filter said measurements from said transmissions and analyze said measurements to generate a metered function of the parameter, and

iii) a transmission module to transmit the metered function over an internet connection; and

c) a data station remote from the plurality of intermediate devices to receive transmitted meter functions from said plurality of intermediate devices.

52. A method of collecting data comprising the steps of:

- a) generating measurements by measuring a parameter using a telemetry device;
- b) storing a plurality of said measurements in a memory;
- c) transmitting said stored measurements to a collection device;
- d) processing said transmitted measurements at the collection device; and
- e) transmitting, under a plurality of triggering conditions, said processed measurements to a monitoring station by a network connection.

53. The method of claim 52, wherein the processing step further comprises filtering said transmitted measurements and storing the filtered measurements.

54. The method of claim 52, further comprising the step of computing a metered function representing consumption information at the monitoring station

55. The method of claim 52, further comprising the steps of:

storing an old number in said collection device;  
generating a new number in said telemetry device for each generated measurement; and

comparing said old number to said new number to determine which measurements are new measurements not previously received by said collection device and whether there are missing measurements.

56. The method of claim 55, further comprising the step of storing said old number in said telemetry device, wherein the step of generating said new number includes incrementing said old number.

57. The method of claim 56, further comprising the step of determining the measurement times for new measurements received by said collection device.

58. The method of claim 52, further comprising the step of waiting an alignment time following a measurement to transmit said stored measurements.

59. The method of claim 58, further comprising the steps of:

transmitting said alignment time from said telemetry device to said collector in a transmission;

determining a receipt time representing the time said collector receives said transmission; and

subtracting said alignment time from said receipt time to generate a time representing the measurement time of the most recent measurement in the transmission.

60. The method of claim 52, wherein said parameter is selected from the group consisting of electrical power, fluid flow, voltage, current, temperature, pressure, and humidity.

*Sub 11* A method of collecting data comprising the steps of:

receiving a series of successive measurements from a series of transmissions from a telemetry device;

storing and filtering the series of successive measurements by a pathway device connected to a LAN transceiver capable of receiving the series of transmissions; and

transmitting the filtered data through an internet connection to a remote center for generation of a metered output function at the remote center.

